(12) UK Patent Application (19) GB (11) 2 112 113 A

(21) Application No 8232093
(22) Date of filing 10 Nov 1982
(30) Priority data
(31) 8106995
(32) 24 Nov 1981
(33) Sweden (SE)
(43) Application published
13 Jul 1983
(51) INT CL³
F16K 11/06
(52) Domestic classification
F2V R2
(56) Documents cited
GBA 2067266
GB 0194308
(58) Field of search
F2V
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(54) A mixing tap for one hand operation

(57) Rotary movement of the outlet member (7, 11, 12, 13) in relation to the valve housing (1) causes the through channels (6, 6') in a disc 5 to rotate relative to the openings in a disc 3 which communicate with the inlet channels (2, 2'), so as to cause a change in the mixing proportions between cold and hot water. The outlet member (7, 11, 12, 13) is attached rotatably, but axially non-movably, to the valve housing (1) by means of a nut (9) which is centrally located and attached to the valve housing (1).

Fig. 1

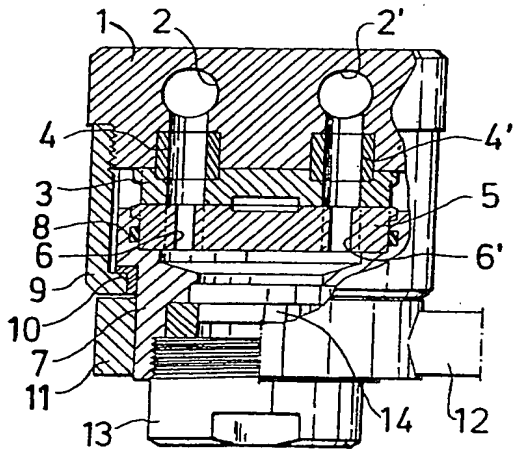

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Fig.1

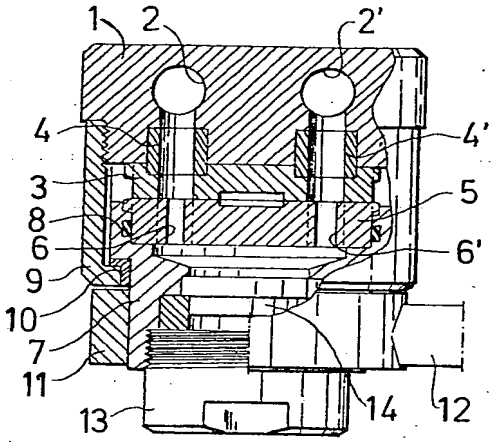
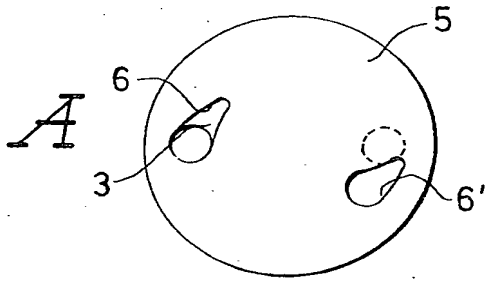
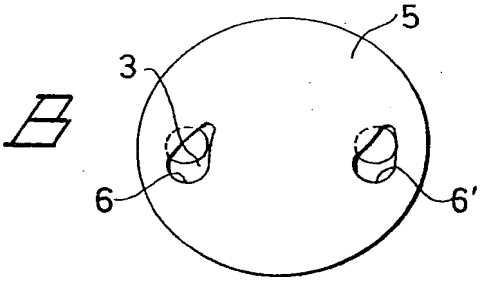


Fig.2





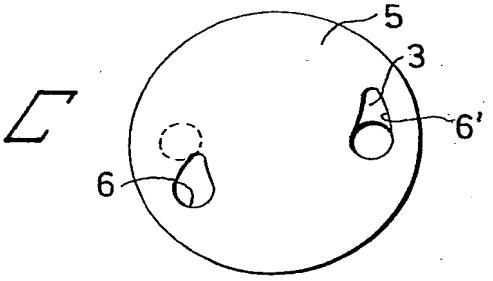


Fig.3

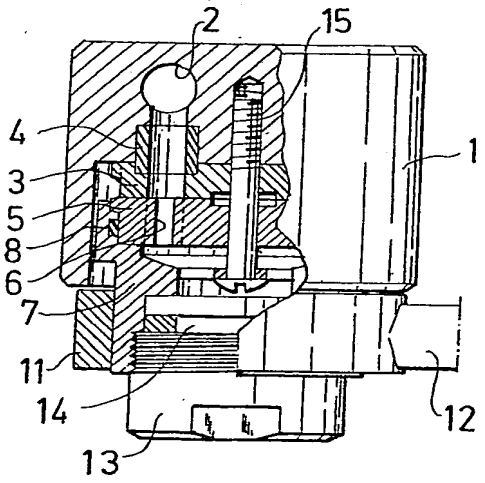


Fig. 4

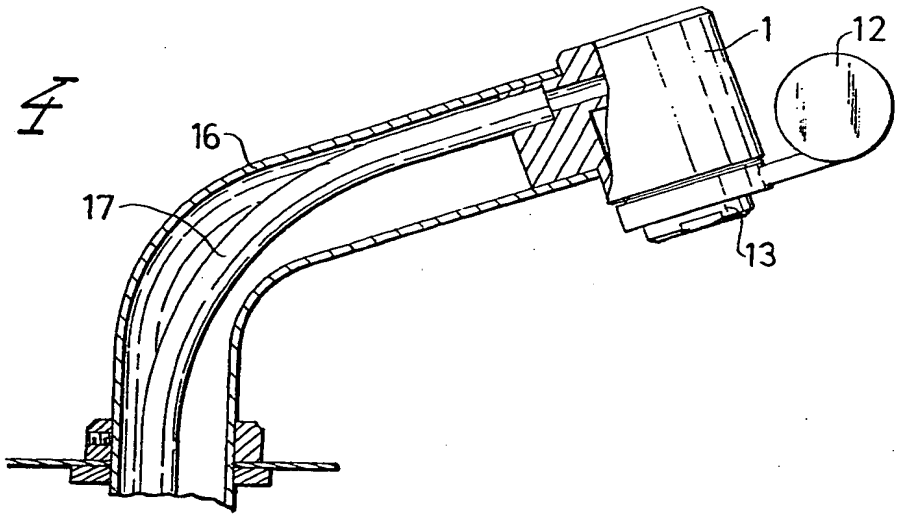
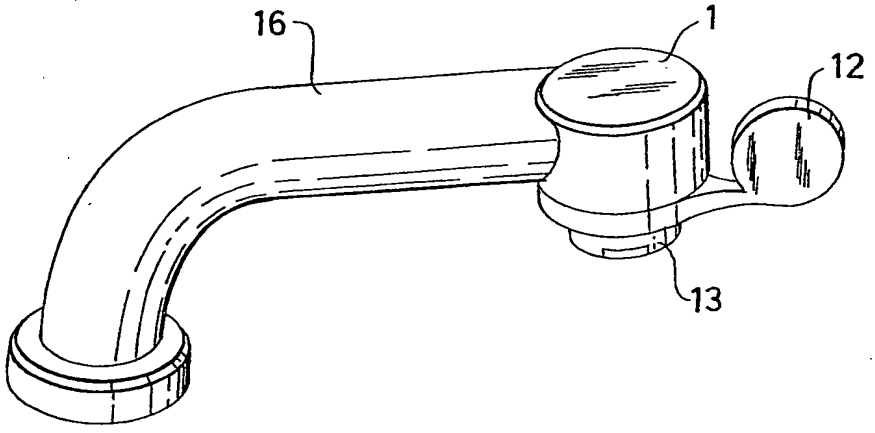


Fig. 5



SPECIFICATION

Mixing tap

This invention relates to a mixing tap (faucet), and in particular to a one hand operable tap, in which movement of a control lever is arranged to secure desired adjustment of the mixing ratio between hot and cold water.

A number of types of such mixing taps are previously known, such as that disclosed in U.S. Patent No. 3,345,910, having a valve member arranged to be both rotatable and axially movable within a surrounding valve housing, said valve member having a partly surrounding annular groove with a successively varied cross-sectional area. By means of an axially sliding movement, said groove can be arranged communicating with two inlet openings for hot and cold water, as well as an outlet opening. The valve member can also be rotated in relation to the surrounding valve housing, thereby simultaneously reducing the flow area with regard to one inlet opening and correspondingly increasing the flow area with regard to the second inlet opening. Provided that the valve member is not subject to an axial movement, the flow to the outlet is maintained basically unchanged. Other known types of mixing taps for one hand operation can substantially be related to the type disclosed above, even though certain differences in design exist, particularly with regard to the method in which the valve member is arranged to cause flow communication between the inlet openings and the outlet opening in the surrounding valve housing.

A major disadvantage with previously known mixing taps is the rather complicated mechanical design, which results in high manufacturing costs. Furthermore, the reliability in operation is also unsatisfactory, and leakage often occurs at the valve member, spindle and lever connection. Many previously know types also have a further disadvantage, since a change in the adjustment of mixing ratio also causes a change of the outlet flow.

It is an object of this invention to provide a single hand operated mixing tap which is easy to manufacture, and of low manufacturing costs. A further object is to provide a mixing tap with high operating reliability, completely without previously known problems with regard to seals located on spindles and lever connection, and also arranged to facilitate a constant outlet flow, as well as having simple adjustment of the mixing ratio. A further object is to arrange the manually operable control lever centrally and extending outwardly from the outlet member, which is not only aesthetically attractive, but also facilitates easy adjustment of the mixing ratio.

The mixing tap according to this invention includes a valve housing having inlet channels for hot and cold water respectively, and is generally characterised by the valve housing being attached to an outlet member, which is rotatably arranged in relation to the valve housing, and which includes a member in contact with the outlet openings of the inlet channels, said member including two through channels located in a configuration substantially corresponding to the location of the outlet openings of the inlet channels, a rotary movement of the outlet member in relation to the valve housing being arranged to facilitate establishment of a first position, in which position the through channels do not communicate with the inlet channels, and also arranged to facilitate establishment of a second position, in which said channels substantially correspondingly communicate with the inlet channels, adjacently located rotary positions being arranged to cause an increase or decrease, of the flow of warm, respectively cold water, transferred to the outlet member via the through channels, a rotary movement in reversed direction causing a reversed ratio with regard to the mixed proportions of hot and cold water.

An embodiment as an example of a mixing tap according to the present invention is more fully described below with reference to the accompanying drawings, in which:—

Figure 1 shows a side view, partly in cross-section, of a mixing tap according to the present invention,

Figure 2 shows the alternative adjustment positions, which result in three different mixed proportions of hot and cold water supplied to the outlet member,

Figure 3 shows a view substantially corresponding to Figure 1, slightly modified in relation to the embodiment shown in Figure 1,

Figure 4 shows a cross-sectional view of a wash basin mixing tap, arranged according to the present invention, liquid mixing members not being shown, and

Figure 5 shows a perspective view of the wash basin mixing tap shown in Figure 4.

With reference to Figure 1, a valve housing 1 is shown, having inlet channels 2, 2′ for hot and cold water respectively. At the outlet portions of said inlet channels 2, 2′, a first valve disc 3 is arranged, having two through holes, located correspondingly to the outlet openings of the inlet channels 2, 2′. The portions of the holes in the first valve disc 3 and the inlet channels 2, 2′ directed towards each other are arranged with an enlarged diameter, embracing two tubular bushings 4, 4′, which join the valve housing 1 and the first valve disc 3.

Against the plane of the first valve disc 3 directed away from the valve housing 1, a second valve disc 5 is arranged in sealing contact against the first valve disc 3. The second valve disc 5 is arranged with two through channels 6, 6′. Said through channels 6, 6′ have such a location and shape, that a rotary movement of the second valve disc 5 in relation to the first valve disc 3 first causes a flow from one inlet channel, e.g. 2, to flow through the channels 6, 6′. When the rotary movement is continued, both inlet channels 2, 2′ will communicate with the through channels 6, 6′, and a further continued rotary movement causes the inlet channel 2′, which originally was closed, to communicate with the through channels 6, 6′.

If the rotary movement is further continued, none of the inlet channels 2, 2' will obviously be in communication with the through channels 6, 6', i.e. the flow is interrupted.

The outer edge portion of the second valve disc 5 is embraced by a tubular adjustment member 7, and an O-ring 8 is located in an intermediate position between the contact surfaces of the second valve disc 5 and the adjustment member 7 in a groove taken up in the adjustment member 7. The external diameter of the adjustment member 7, with regard to the portion directed away from the second valve disc 5, is smaller than the external diameter at the portion surrounding said valve disc 5, and the surface formed at the intersection point between the two diameters is used to contact an inwardly directed flange extending from a nut 9, which is attached to the valve housing by means of a screw thread. In order to reduce existing friction between the nut 9 and the adjustment member 7, a friction reducing ring-shaped member 10 is arranged between the nut 9 and the adjustment member 7.

The external portion of the adjustment member 7 extending from the nut 9 is attached to a surrounding member 11, from which a control lever 12 extends. Furthermore, the internal free portion of the adjustment member 7 is arranged connected to a nozzle 13, and the nozzle 13 also retains a flow regulator 14 within the adjustment member 7.

With reference to Figure 1, the second valve disc 5, the adjustment member 7, the surrounding member 11 with associated control lever 12, the nozzle 13, and the flow regulator 14, form one unit, which, when the control lever 12 is manually influenced, can be rotated in relation to the remaining members, i.e. the valve housing 1, the first valve disc 3 and the nut 9. Such a rotary movement facilitates a change between open and closed position, and in the open position also desired adjustment of the mixing ratio between hot and cold water.

Previously discussed flow regulator 14 is of a known type, manufactured from rubber, synthetic rubber or a synthetic plastic material, arranged to reduce available through flow area when the pressure at the inlet side is increased, and to increase the through flow area when the pressure at the inlet side is decreased. Hereby in a constant flow achieved to the nozzle 13.

The valve discs 3, 5 are preferably manufactured from a ceramic material, which facilitates an extremely good surface finish, and thus no need for any sealing members between the valve discs 3, 5. Ceramic materials are also preferred with regard to wear, as well as with regard to corrosion. However, it should be emphasized that other materials can be used, and also that ring-shaped sealing members obviously can be located in an intermediate position between the valve discs 3, 5 in grooves in same.

The friction reducing member 10 can also be manufactured from a number of different types of material, but synthetic plastics material are preferred, e.g. PTFE. However, also other types of materials can be used, which have suitable friction reducing properties.

The above discussed embodiment uses a nut 9 to hold together the elements, but also other technical solutions can be used. An embodiment of such an alternative solution is illustrated in Figure 3. Said figure is substantially equal to Figure 1, but the valve housing 1 has been arranged with an annular flange directed towards the jet concentrator 13, which replaces the previously used nut 9 with regard to a surrounding component. In order to hold all elements together, the modified embodiment uses a screw 15, extending through a centrally located hole in the valve discs 3, 5, attached to an internally threaded bottom hole in the valve housing 1. The adjustment member 7 is also slightly modified, having a centrally located hole through which the screw 15 extends, and against which the head of the screw 15 takes up contact. In order to facilitate a flow of water from the channels 6, 6' to the flow regulator 14 and the jet concentrator 13, the wall portion of the adjustment member 7, in which the centrally located hole for the screw 15 is arranged, also includes a number of surrounding holes, which facilitate a flow of water from the channels 6, 6'. This embodiment is from aesthetical point of view very attractive, since the valve housing 1 can be arranged as a unit, which extends to a point adjacent to the member 11 surrounding the nozzle 13 and associated control lever 12. Also with regard to costs, this embodiment is preferred, since manufacturing costs are further decreased.

The method in which the valve discs 3, 5 co-act during a rotary movement of the second valve disc 5 in relation to the first valve disc 3, is schematically shown in Figure 3. Said figure shows the valve discs 3, 5 viewed from the rotatable second valve disc 5, and in the position indicated as A, the second valve disc 5 is located in a position which only facilitates supply of water from one inlet channel 2, whereas the other inlet channel 2' is completely closed off. In the position indicated as B, the valve discs 3, 5 are shown in a second position, in which both inlet channels 2, 2' substantially equally communicate with the channels 6, 6' in the second valve disc 5. Finally, in the position indicated as C, the inlet channel 2, open in position A, is closed, whereas the previously closed inlet channel 2 is opened. There is obviously a further position when both inlet channels 2, 2' are closed, but since this position is accomplished by means of a further rotary movement from the positions shown in A or C, it has not been regarded as necessary to illustrate same.

In order to illustrate how a water mixing tap can be arranged for a certain purpose, Figures 4 and 5 show an example of a wash basin tap, arranged according to the present invention. With reference to Figure 4, this illustrates how the valve housing 1 can be attached to a suspending tubular member 16, in which the supply pipes 17 (only

one shown) can be located, attached to the valve housing 1 for example by means of soldered joint. When said joint has been produced, the valve housing 1 is inserted into the tubular member 16. The valve housing 1 can be retained within the tubular member 16 by means of frictional contact, adhesive or in any other way, and obviously also by means of a threaded joint. The assembled wash basin mixing tap is shown in perspective view in Figure 5, and said figure is mainly intended to illustrate the attractive shape of the mixing tap.

A number of mixing taps of the above discussed type can obviously also be arranged within the same surrounding housing, e.g. intended to act as a combination for a bath and a shower whereby it would be possible to simultaneously fill the bath and use associated shower attachment. There are also other fields of use, but a primary fact is, that simple and standardised mixing unit can be used for several purposes.

For certain purposes, it may be advantageous to arrange the valve housing as an integrated member with the intended fitting, and this would also be possible, while maintaining the major and characteristic features of the present invention with regard to the design of a mixing tap.

It should also be mentioned, that the first valve disc 3 for certain applications may be excluded, and arranged as an integrated part of the valve housing 1. For such applications where a constant flow is of minor importance, the previously mentioned flow regulator 14 can also be excluded, particularly when the through channels 6, 6′ in the second valve disc 5 are arranged with such a shape, that a substantially constant outlet flow can be maintained when one of the channels 6, 6′ have been arranged to communicate with one of the inlet channels 2, 2′.

Futhermore, it may also be advantageous to arrange a stop member in the tap, which prevents the second valve disc 5 from being moved past a position in which hot water is flowing out. As a result, cold water would first flow out when opened from a closed position and thereafter would produce mixed hot and cold water and finally substantially only hot water. From the latter position, a return movement must be made past the position in which cold water flows to the closed position, and this would prohibit a closing operation to be carried out in reversed direction, i.e. from hot to a closed position, which would cause an obvious risk when the control lever 12 is moved from a closed position. Furthermore, the stop member is also advantageously adjustable, in order to facilitate preadjustment of a certain maximum temperature for outflowing water.

The present invention can thus be modified in a number of ways and the embodiments are only intended to serve as examples within the scope of the invention.

As an example of a further modification the second valve disc 5 and the adjustment member 7 can be arranged as a rigidly joined unit with the screw 15 in contact against the second valve disc 5, in order to hold all elements together. Between the head of the screw 15, and the member held by same, preferably the adjustment member 7 or the second valve disc 5, a washer is advantageously arranged, in order to reduce existing friction between the head and adjacently located member, 5 or 7.

Finally, it should be mentioned that the shape of the through channels 6, 6′ can be varied in a number of ways, from a substantially circular cross-sectional area to a longitudinally extending cross-sectional area, and for certain applications the outlets of the channels 6, 6′ may also be orientated in substantially the same location.

CLAIMS

1. Mixing tap for one hand operation, including a valve housing having inlet channels for hot and cold water respectively, characterised by the valve housing (1) being attached to an outlet member (7, 11, 12, 13), which is rotatably arranged in relation to the valve housing (1), and which includes a member (5) in contact with the outlet openings of the inlet channels (2, 2′), said member including two through channels (6, 6′) located in a configuration substantially corresponding to the outlet openings of the inlet channels (2, 2′), a rotary movement of the outlet member (7, 11, 12, 13) in relation to the valve housing (1) being arranged to establish a first position, in which position the through channels (6, 6′) do not communicate with the inlet channels (2, 2′), and also to establish a second position, in which said through channels (6, 6′) substantially communicate with the inlet channels (2, 2′), adjacently located rotary positions to the second position being arranged to cause a change in the mixing proportions between hot and cold water, which is supplied through channels (6, 6) to the outlet member (7, 11, 12, 13).

2. Mixing tap according to Claim 1, wherein the outlets of the inlet channels (2, 2′) are formed by means of through channels or holes taken up in a first valve disc (3) arranged within the valve housing (1), the member (5) in contact with the outlet openings comprising a second valve disc (5).

3. Mixing tap according to Claim 1 or 2, wherein the member (5) in contact with the outlet openings of the inlet channels (2, 2′) is embraced by an adjustment member (7), extending in a direction away from the valve housing (1), forming a part with, or being joined to a manually operable control lever (12), extending in direction away from the adjustment member (7).

4. Mixing tap according to any one of Claims 1, 2 or 3, wherein nut (9) is attached to the valve housing (1), having an inwardly directed surrounding flange, said flange being arranged to contact an annular wall portion at the adjustment member (7), thereby holding together the adjustment member (7) and the member (5) which contacts the inlet channels (2, 2′) in a suspended contact position against the outlet openings of the inlet channels (2, 2′).

5. Mixing tap according to Claim 4, wherein

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friction reducing substantially annular element (10) is located in an intermediate position between the inwardly directed flange of the nut (9) and the wall portion of the adjustment member (7).

6. Mixing tap according to any one of Claims 1, 2 or 3, wherein the valve housing (1) and the outlet member (7, 11, 12, 13) with associated members are held together in relation to each other as a rotatable unit by means of a centrally located screw (15) or similar means, attached to the valve housing (1).

7. Mixing tap according to any one of Claims 1, 2, 3, 4, 5 or 6, wherein a flow regulator is surrounded by the adjustment member (7).

8. Mixing tap according to any one of Claims 1, 2, 3, 4, 5, 6 or 7, wherein at least one substantially ring-shaped sealing member is located in an intermediate position between the member (5) in contact with the outlet openings of the inlet channels (2, 2') and the plane where said inlet channels (2, 2') open.

9. Mixing tap according to any one of Claims 1, 2, 3, 4, 5, 6, 7 or 8, wherein a rotary movement restricting stop member is arranged, whereby the control lever (12) when moved from a closed position first results in supply of cold water to the outlet member (7, 11, 12, 13), and thereafter warm and finally hot water, said stop member being adjustable.

10. Mixing tap according to any one of Claims 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, wherein the valve housing (1) is arranged to facilitate attachment to a tubular suspending member (16).

11. A mixing tap as described herein and with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1983. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

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